

WASHINGTON DEPARTMENT OF ECOLOGY
ENVIRONMENTAL ASSESSMENT PROGRAM
FRESHWATER MONITORING UNIT
STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 25F060
STATION NAME: Mill Creek
WATER YEAR: 2013
AUTHOR: Casey Clishe

Introduction

Watershed Description

Mill Creek is one of three watersheds in the Lower Columbia River Intensively Monitored Watersheds project complex. Over 95% of the underlying lithology is of volcanic origin, consisting primarily of flow basalts with interbedded sandstone. The basin is rain dominated with an average annual precipitation rate of 63 inches. Focal species within the drainage include coho, chinook, chum, steelhead, and cutthroat. Land cover is 94% forested. The Department of Natural Resources manages 68% of the forested lands and private landowners manage 32%. Road density estimates in the complex range from 4.2 to 5.8 miles per square mile.

Gage Location

The monitoring station on Mill Creek is located at the Mill Creek Road bridge approximately 0.3 miles upstream from the confluence with the Columbia River.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	30.5
Latitude (degrees, minutes, seconds)	46 11 26 N
Longitude (degrees, minutes, seconds)	123 10 43 W

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	122
Median Annual Discharge (cfs)	91
Maximum Daily Mean Discharge (cfs)	658
Minimum Daily Mean Discharge (cfs)	14
Maximum Instantaneous Discharge (cfs)	972
Minimum Instantaneous Discharge (cfs)	12
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	284
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	20
Number of Days Discharge is Greater Than Range of Ratings	1
Number of Days Discharge is Less Than Range of Ratings	0
Number of Un-Reported Days	1
Number of Days Qualified as Estimates	201
Number of Modeled Days	0

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

Table 2 Discussion (Discharge Statistics)

Unlike water years 2011 and 2012, the discharge record for water year 2013 was not impacted by backwater effects from the Columbia River. One day was excluded from the discharge statistics due to a rating curve exceedance. The discharge pattern could best be described as moderate during the year with the largest discharge event peaking in mid-November. There were no exceptionally large storm events. A relatively steady decline to baseflow conditions began in late May. What appears to be a diel evapotranspiration signal in discharge expressed itself from mid-summer to the beginning of September 2013 when an early fall storm event elevated discharge above baseflow. Two relatively large events at the very end of September elevated discharge substantially above baseflow conditions.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	32.3
Potential Weighted Rating Error (% of discharge)	11.2
Total Potential Error (% of discharge)	43.5

Table 3 Discussion (Error Analysis)

The total potential error (TPE) for water year 2013 is exceptionally high. The reason for the extraordinarily high values is the large, random discrepancy between the observed primary gage index value (a staff gage) when compared to the stage value recorded on the datalogger. Despite changes to the pressure transducer used to record the logged stage value, this discrepancy continues to be large and random. Total Potential Error (TPE) is the sum of the logger drift error and the weighted rating error. The logger drift error is associated with the difference between the observed value of the primary gage index and the paired stage value logged within the continuous record. The weighted rating error is associated with the quality of discrete discharge measurements used to develop rating curves. The TPE is consistently applied as a range of predicted discharge throughout the hydrograph for the entire water year. For example, if the predicted discharge for WY2013 at Mill creek is 100 cfs, the range of predicted flows incorporating the TPE is 143.5 to 56.5 cfs. If the predicted flow is 10 cfs, the range of predicted flows incorporating the TPE is 14.3 to 5.6 cfs.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	1.70
Maximum Recorded Stage (feet)	5.73
Range of Recorded Stage (feet)	4.03

Table 4 Discussion (Stage Record)

The stage record at Mill Creek for WY2013 is continuous and complete. The unusually large and somewhat random discrepancies between the primary gage index observations and the comparative stage values recorded on the datalogger were resolved using the data shift function. These unusually large discrepancies resulted in numerous exceedances of the logger drift error thresholds. These exceedances manifested themselves in the stage record when large portions of the stage record for water year 2013 were quality coded as estimated.

Table 5. Rating Table Summary

Rating Table No.	402	301	
Period of Ratings	10/01-09/30	9/28-9/30	
Range of Ratings (cfs)	4.4-994	7.0-994	
No. of Defining Measurements	35	22	
Rating Error (%)	11.2	10.6	

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Table 5 Discussion (Rating Tables)

Rating table 402, a replica of rating table 4, predicted discharge for virtually all of water year 2013 when coupled to continuous stage record. Rating table 301, a replica of rating table3, predicted discharge for the last two days of the water year. A slight filling of the control during the unusually large late September precipitation events resulted in the short lived shift from rating 402 to rating 301.

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	
Range of Modeled Stage (feet)	
Range of Modeled Discharge (cfs)	
Valid Period for Model	
Model Confidence	

Table 6 Discussion (Modeled Data)

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Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date

Table 7 Discussion (Surveys)

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Activities Completed

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Appendix